

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Frank Henglein, et al.

Confirmation No.: 7418

Serial No.: 10/580,120

Group Art Unit: 1793

Filed: September 11, 2006

Examiner: Pegah Parvini

For: EFFECT PIGMENTS HAVING AN ALUMINUM OR ALUMINUM ALLOY CORE,  
PROCESS FOR THE PRODUCTION THEREOF AND USE THEREOF

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Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

**DECLARATION UNDER 37 C.F.R. §1.132**

Sir:

1. I, Frank Henglein, Ph.D, am a German citizen residing at Virchowstrasse 17, 90409 Nurnberg, Germany. I am a co-inventor of the above-identified U.S. patent application. As further detailed below, I am employed by Eckart GMBH the owner by Assignment of the patent application. I have read and am familiar with the U.S. Patent Office Action dated March 18, 2008 concerning the subject application. I understand that the Examiner has rejected the claims of the application as being allegedly obvious to one having ordinary skill in this art over the combined disclosure of U.S. Patent No. 5,624,486 to Schmidt et al and U.S. Patent No. 6,648,957 to Andes et al. I am making this declaration to support the patentability of the claims of our above-identified U.S. patent application.
2. From 1982 to 1989 I studied Chemistry at the Technical University in Berlin and at the University of Bayreuth, Germany. Between 1989-1993 I studied for and obtained my Doctorate degree in Physical Chemistry (Electrochemistry) at the Fritz-Haber-Institute in Berlin, Germany. From 1993-1997 I engaged in post-doctoral studies at the Hahn-Meitner-Institute in Berlin, Germany, dealing with Nano-colloid chemistry. I also undertook additional post-doctoral studies at Forschungszentrum Julich, also located in Berlin, involving research concerning fuel cells, electrocatalysis and the synthesis of nanometal clusters.

3. Regarding my relevant employment experience, I joined Eckart GMBH as a Research and Development Project Manager in 1997. From 2000-2004 I served as the Senior Project Manager of Eckart's Research and Development department where I was responsible for the development of new metal effect pigments. In particular, I was responsible for the project that led to the filing of the above-identified U.S. patent application. In accordance with my background in physical chemistry and, in particular, nano-chemistry, and in view of my employment experience relating to the basic properties of metal effect pigments as described above, I am quite familiar with the interpretation of scanning electron photomicrographs such as those attached as exhibits to this declaration. Since January 1, 2004 I have been employed as the head of the Intellectual Property Department of Eckart GMBH.
4. Attached as Exhibits A-C to this declaration are three scanning electron microscope (SEM) photomicrographs of aluminium effect pigments. These photomicrographs demonstrate the unique features of the presently claimed effect pigments as recited in, e.g., claim 1 of this application. Exhibit A is a SEM photomicrograph of a wet chemical oxidized aluminum pigment, i.e., as described in claim 1 of the present patent application. Exhibit B is a SEM photomicrograph of an SiO<sub>2</sub> effect pigment produced in accordance with the wet chemical process described in the U.S. Patent No. 5,624,486 to Schmidt et al., which has been cited by the U.S. Patent Examiner in the current Patent Office Action concerning this application. Exhibit C is provided for purposes of further contrast in that it is a photomicrograph of an uncoated aluminum pigment. The magnification factor in the case of each of the Exhibits A-C is 50,000x.
5. As can be seen in Exhibit A, i.e., the pigment according to claim 1 of the present application, the surface of the wet chemically oxidized aluminum pigment illustrated therein is roughened and structured so as to comprise dendritic elevations and depressions. The features of the pigment are described, for example, at p. 8, lines 10-16 in the specification of our application. The cited portion of the specification describes how the roughened structure of the pigment provides the pigment with a "soft color flop", i.e., in contrast to pigments such as

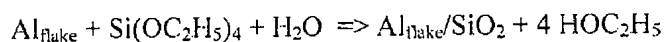
that shown in Exhibit B that are produced according to the wet chemical process as described in the Schmidt et al. '486 U.S. patent., which have a strong color flop.

During the oxidation process hydrogen is released as summarized by the following equation:



The hydrogen is released directly on the surface of the metal pigment. At the same time  $\text{Al}^{3+}$  ions generated by the oxidation are precipitated very fast as oxide on the flakes surface. The hydrogen gas has to "escape" through the developing aluminium oxide layer leading to holes and the rough structure of the aluminium oxide observed in the SEM picture. Furthermore the metal core itself can additionally be roughened by this type of reaction by sort of an etching process. The aluminium oxide layer is formed quite unusually by growing into the metal surface by oxidation of the metal as well as outside by the developing oxide. The roughened structure shown in Exhibit A is uniquely attributable to producing the pigment with the use of the chemical wet process oxidation technique that is recited in claim 1 of our application.

6. Exhibit C, which is provided for further contrast, shows an uncoated aluminum pigment, having a smooth and flat surface without any noticeable surface roughening.
7. The following discussion concerns a comparison between Exhibit A, i.e., illustrating a pigment produced according to claim 1 of the present patent application, having a roughened dendritic surface, and Exhibit B which illustrates a pigment produced according to the Schmidt et al. patent. As indicated above, Exhibit B illustrates an aluminum pigment that has been wet chemically coated with  $\text{SiO}_2$  by a sol-gel process. The sol-gel process is a mild chemical route of obtaining metal oxides and – referring to col.6, l. 25-28 of the Schmidt et al. patent – can be summarized as:



Here no oxidation occurs and simply an alcohol is released.

The pigment illustrated in Exhibit B is provided with a granular surface structure without the surface roughening as found in the pigments shown in Exhibit A. The granular structure is formed of small beads of  $\text{SiO}_2$  formed on the surface of the coated pigments. A certain granular structure can be found by any coating of a metaloxide formed by either conventional wet chemical processes or by CVD (Chemical Vapour Deposition) processes, as described for layer B in the Schmidt et al. patent. Such granular structures are typically scaled in the range of just a few nanometers and have practically no impact on the optical properties of the interface between two adjacent layers. Significant changes of the optical properties like for example scattering phenomena typically occur at larger scales.

8. As taught at p. 8, lines 13-16 of the present specification the structure of a pigment has a direct effect on the color flop properties of the pigment. In contrast to the soft color flop provided by the pigments according to the present invention, i.e., as shown in Exhibit A, the Schmidt reference teaches (see Col. 2, lines 37-39) that it is an object of the pigments described in the Schmidt reference to provide a particularly strong metallic effect, i.e., which is understood by one such as myself skilled in this art to mean that such pigments have a strong color flop.
9. A comparison of, e.g., Exhibits A and B clearly demonstrates that the pigments produced in accordance with claim 1 of the present application, i.e., utilizing a chemical wet process oxidation technique, have an entirely different appearance in comparison to pigments produced according to the Schmidt reference, i.e., using a wet chemical process. This difference in appearance between the two pigments produces a substantial difference in the color flop property of the two pigments, i.e., such that pigments produced with a chemical wet process oxidation technique according to claim 1 of the present application have a soft color flop, whereas pigments produced by a wet chemical process, i.e., according to Schmidt have a particularly strong color flop. The difference in color flop is directly

attributable to the roughened surface on the surface of the pigment produced in accordance with claim 1 of the present application, i.e., as shown in Exhibit A. The pronounced roughened structure shown in Exhibit A permits the production of a mixed layer containing a highly refractive metal chalcogenide which is responsible for the soft interference color flop obtained with the pigments produced according to the present application (as recited, e.g., in claim 1 of this application).

10. To briefly summarize, the pigments produced according to claim 1 of the present application, i.e., using a chemical wet process oxidation technique, as shown in Exhibit A, have a completely different appearance than pigments formed according to the wet chemical process as taught in the Schmidt et al. '486 U.S. patent. Due, moreover, to the differences in their surface structure, the pigments differ substantially with regard to their color flop properties, with the pigments according to our invention as shown in Exhibit A having a soft interference color flop and the pigments produced according to the wet chemical process of the Schmidt et al. patent having a strong color flop.
11. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 05/16/09

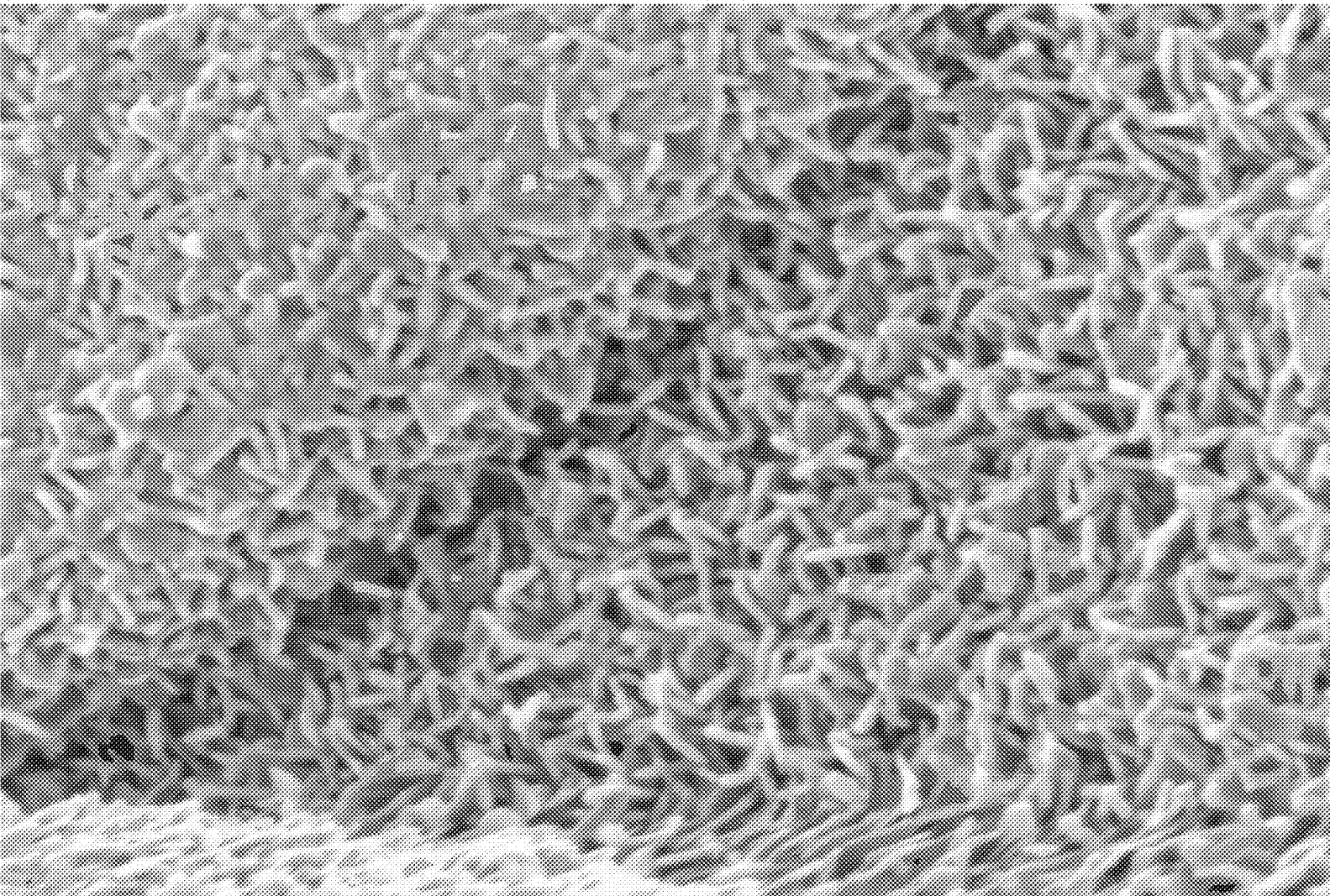
By: Frank Henglein  
Dr. Frank Henglein


**EXHIBIT A**

**TO THE**

**DECLARATION UNDER 37 C.F.R. §1.132**

**of DR. FRANK HENGLEIN**



100nm  


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Vergrößerung = 50.00 K X	Signal A = InLens	Zeit :10:52:28
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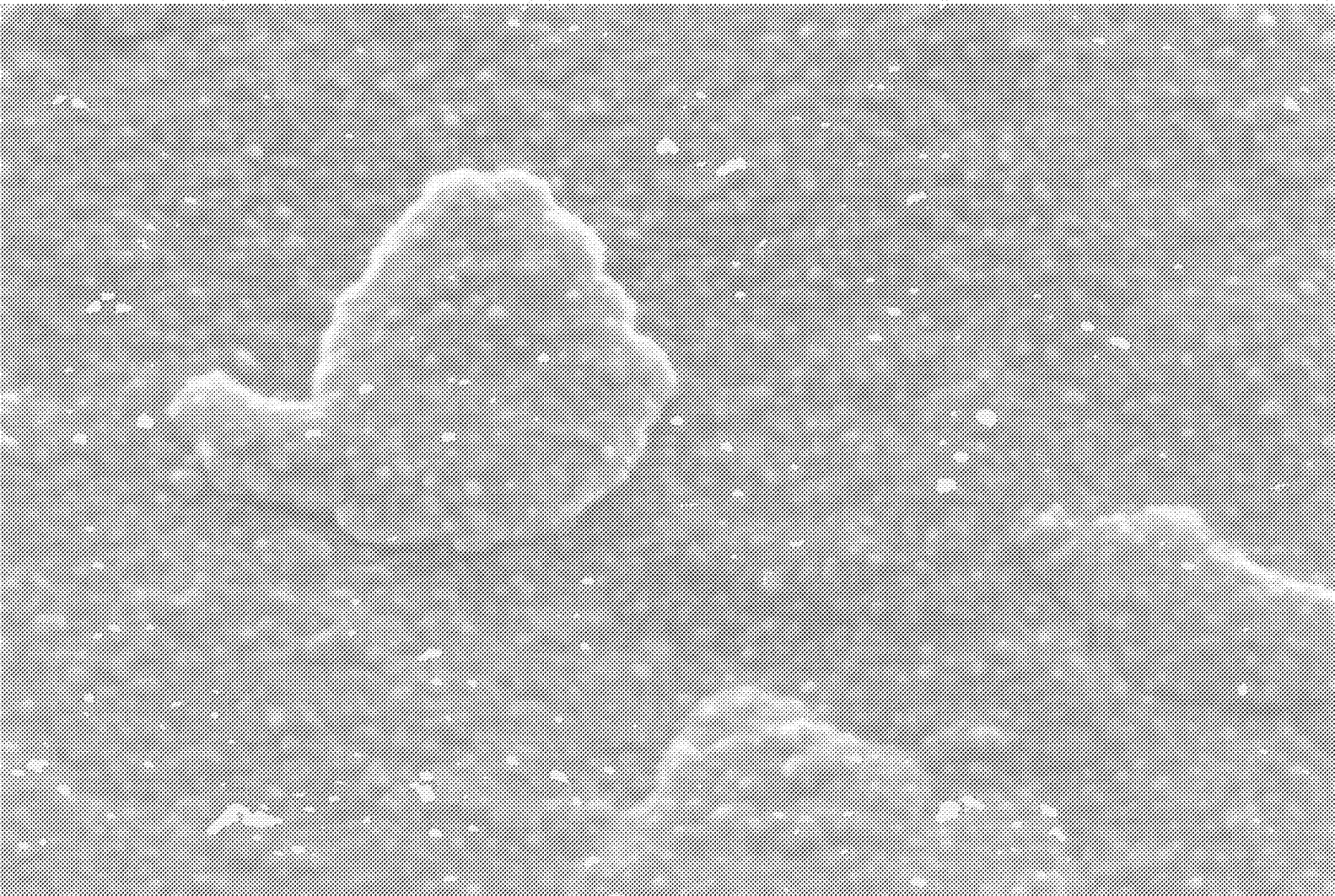
**EXHIBIT B**

**TO THE**

**DECLARATION UNDER 37 C.F.R. §1.132**

**of DR. FRANK HENGLEIN**





200nm  
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Vergrößerung = 50.00 K X

Detektor = InLens

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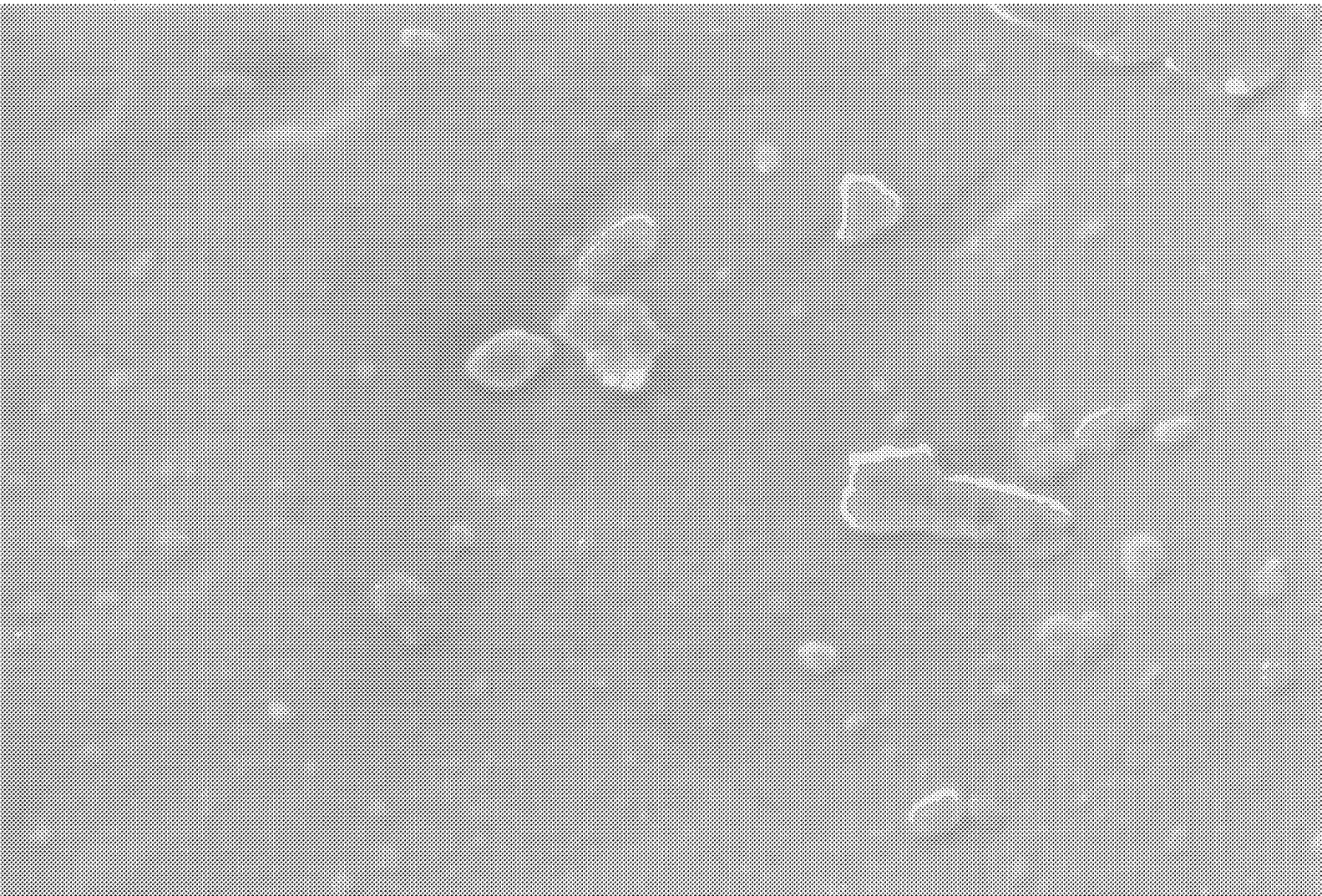
**ECKART**  
Effect Pigments


**EXHIBIT C**

**TO THE**

**DECLARATION UNDER 37 C.F.R. §1.132**

**of DR. FRANK HENGLEIN**



100nm  


Arbeitsabstand = 4 mm      Hochsp. = 0.50 kV  
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Datum :12 Mai 2005  
Zeit :16:32:11